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| APPLICATION NO.                | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--------------------------------|-------------|----------------------|---------------------|------------------|
| 10/727,038                     | 12/04/2003  | Kazuyuki Mitsuoka    | 33082M185           | 4856             |
| 7590 06/15/2006                |             | EXAMINER             |                     |                  |
| Smith, Gambrell & Russell      |             | SELLMAN, CACHET I    |                     |                  |
| 1850 M Street, N.W., Suite 800 |             | ART UNIT             |                     |                  |
| Washington, DC 20036           |             | PAPER NUMBER         |                     |                  |

1762

DATE MAILED: 06/15/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                        |  |                     |  |
|------------------------------|------------------------|--|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> |  | <b>Applicant(s)</b> |  |
|                              | 10/727,038             |  | MITSUOKA ET AL.     |  |
|                              | <b>Examiner</b>        |  | <b>Art Unit</b>     |  |
|                              | Cachet I. Sellman      |  | 1762                |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 December 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10/25/2004</u> .  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 13, 15, 19-21 and 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Ross (US 2001/0000415 A1).

Ross discloses a process for forming an inorganic film on a surface of an organic film on a substrate by modifying the organic film and imparting an affinity for the inorganic film by curing with electron beams in a rare gas atmosphere and forming an inorganic film over the organic film (abstract, 0039-0042] as required by **claim 13**. The modifying step applied a voltage of 20kV or below to the electron beam device [0040-41] as required by **claim 15**. The voltage applied to the device is changed while irradiating the organic film with electron beams from 1-15 KeV for curing and 0.5 – 3 KeV for surface treatment [0040-41] as required by **claims 19-21**. The organic film is a film of a compound containing silicon, carbon, hydrogen and oxygen [0027] as required by **claim 23** The film is a methylsilsesquioxane [0029] as required by **claim 24**.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 14, 16-18 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ross as applied to claim 13 above.

The teachings of Ross as applied to claim 13 are as stated above.

Ross does not teach that the modifying step changes the pressure, that the second pressure is higher than the first and that the second pressure is above 1 torr, that the pressure and voltage are changed simultaneously as required by **claims 14, 16-18 and 22** respectively.

However, Ross does teach that one having ordinary skill in the art can adjust the process conditions in order to treat the surface. Therefore the pressure and voltages are result effective variable. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the conditions to be within the claimed range in order to remove the moisture and particles on the surface and to prepare it for subsequent layers especially absent any criticality in using the conditions in the claimed range.

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4. Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gallagher et al. (US 2002/0123240 A1) in view of Ross (SU 2001/0000415 A1) and Angelopoulos et al. (US 6420088 B1).

Gallagher et al. discloses a process of applying a liquid film to the surface of an organic film by modifying the organic film by curing in an oxidizing atmosphere without the use of UV radiation [0012] to impart an infinity for the liquid coating ([0032] and abstract) and then applying the liquid coating to the organic film. Gallagher et al. teaches that the process can be performed in an argon/oxygen atmosphere [0031].

Gallagher et al. does not disclose the use of electron beams or that the liquid film is polar as required by **claim 1**.

Ross discloses a process of treating the surface of dielectric films for subsequent deposition by curing using electron beam exposure. The dielectric film can be a silicon containing polymer such as a silsesquioxane polymer [0027]. The layer is formed on the substrate and is then cured using electron beam exposure. The exposure can be formed in a gaseous ambient of any combination of nitrogen, hydrogen, argon, or oxygen [0041].

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Gallagher et al. to include the use of

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electron beams to cure and modify the layer. One would have been motivated to do so because both disclose processes of curing and modifying a silsesquioxane layer in an atmosphere of argon/oxygen without the use of UV light and Ross further discloses that using the electron beam removes all moisture and contaminants from the surface of the silsesquioxane layer and provides a surface treatment so the other layers will adhere to it therefore one would have a reasonable expectation of success in curing and modifying the layer.

Angelopoulos et al. discloses antireflective/hardmask compositions that are used in lithographic process for electronic devices (abstract), where the layer provides outstanding optical, mechanical and etch selectivity properties and to configure underlying materials such as semiconductor layers (abstract). The composition contains a polymer having SiO moieties (column 3, line 8) and a solvent such as propylene glycol monomethyl ether acetate, cyclohexanone, and ethyl cellosolve acetate (column 7, lines 1-6).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Gallagher et al. to include using the antireflective/hardmask composition of Angelopoulos et al. One would have been motivated to do so because Gallagher et al. teaches that process is performed to improve the adherence of a photoresist or antireflective layer to the organic film [0006, 0013, 0032] and Angelopoulos et al. teaches that the antireflective/hardmask

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composition provides outstanding etch selectivity, optical and mechanical properties therefore one would have a reasonable expectation of success in forming the layer.

Ross teaches that the modifying can be performed at a pressure of  $10^{-5}$ - $10^2$  torr. Ross does not teach that the pressure is 1 torr or above as required by **claim 2**.

However, Ross teaches that the conditions can be adjusted by one of ordinary skill in the art in order to treat the surface. Therefore the pressure is a result effective variable. It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the conditions to be within the claimed range in order to remove the moisture and particles on the surface to prepare it for subsequent layers especially absent any criticality in using the pressures in the claimed range.

Ross teaches that the surface treatment step applies a voltage of 0.5 – 3 kV [0041] as required by **claim 3**.

Ross does not teach that the pressure is changed while irradiating the organic film with electron beams as required by **claims 4-6**.

However, as stated above the process conditions are result effective variables and it would have been obvious to one having ordinary skill to change the conditions for curing and surface treatment as in the claim in order to treat the surface to have an

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affinity for the subsequent layer especially absent any criticality in using the conditions of the claim.

The modifying step changes the voltage applied while irradiating the film with electron beams, the voltage is between 1-15 keV for curing and 0.5-3Kev for surface treatment [0040-41] as required by **claims 7-9**.

The organic film is a methylsilsesquioxane ( [0029] Ross and [0023] Gallagher et al.) as required by **claims 11 and 12**.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cachet I. Sellman whose telephone number is 571-272-0691. The examiner can normally be reached on Monday through Friday, 7:00 - 4:30pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Cachet Sellman  
Patent Examiner  
AU 1762



**TIMOTHY MEEKS**  
**SUPERVISORY PATENT EXAMINER**